

**Original article:**

## **The daytime sleepiness, snoring, and sleep duration effects on patients with type 2 diabetes; a case-control study**

**Hyder O Mirghan\*<sup>1</sup> MD, M.sc, Abdulateef S Elbadawi<sup>2</sup> MPH, MD, Mohammed A. Ahmed<sup>1</sup> MD**

<sup>1</sup>University of Tabuk, Faculty of Medicine, Department of Internal Medicine

<sup>2</sup>University of Tabuk, Faculty of Medicine, Department of Community Medicine

Corresponding author : Hyder O Mirghani , Assistant Professor of Internal Medicine Faculty of Medicine, Tabuk University, Kingdom of Saudi Arabia. PO. Box 74194

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### **Abstract:**

**Introduction:** There is increasing awareness about daytime sleepiness, snoring, and the associated obstructive apnea among diabetic patients.

**Objectives:** To assess the prevalence of daytime sleepiness, sleep duration, and habitual snoring in type2 diabetes mellitus and study their relation to diabetes control.

**Material &Methods:** This case-control study included 102 diabetics patients and 121 healthy controls recruited from a diabetic outpatient clinic in Omdurman –Sudan. Information collected include age, sex, body mass index (BMI), duration of sleep, habitual snoring, and the eight components of (ESS).

**Observation &Results:** High statistical significant differences between diabetic patients and controls were found for daytime sleepiness, duration of sleep and age ( $P<0.001$ ). A significant statistical difference was observed between diabetic patients with good and poor control regarding daytime sleepiness, snoring and body mass index ( $P<0.05$ ).

**Conclusion:** Daytime sleepiness and short sleeping hours were prevalent among patients with type2 diabetes and may impair diabetes control.

**Keywords:** Sleepiness, Diabetes, Sudan

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### **1. Introduction:**

Sleep is affected by a variety of factors, social, environmental, and psychological. The trends towards long working hours without recuperation time and more shift- work may lead to shorter sleeping hours and daytime sleepiness <sup>[1, 2]</sup>.

Diabetes mellitus is a common lifelong disease with high mortality and morbidity, inspire of the progress in therapy still many patients develop complications like myocardial infarction with lethal consequences and marked reduction in quality of life <sup>[3-5]</sup>.

Daytime sleepiness a manifestation of obstructive sleep apnea can lead to mood disturbances and decreased motivation so may impair diabetes self-care, and taking medications at the right time affecting diabetes control. The relation between diabetes mellitus and daytime sleepiness (a manifestation of obstructive sleep apnea) is bidirectional, exacerbating each other. Obstructive sleep apnea may badly affect plasma glucose due to the release of tumor necrosis factors and counter-regulatory hormones <sup>[6-8]</sup>.

Some studies documented the significant and consistent relationship of quantity and quality

of sleep in predicting the development of type 2 diabetes mellitus<sup>[9]</sup>.

To our knowledge, this is the first research to study the daytime sleepiness and sleep duration in Sudan. Sudan is a vast country with social, ethnic, and environmental diversity. Furthermore, there is poverty of health facilities in rural outreaching areas where the traditional healers provide wrong information about diabetes care, so studies conducted in Western countries may not apply to Sudan, thus, we did this research.

**Aims and objectives:** to study the daytime sleepiness, snoring, and sleep duration among patients with type 2 diabetes mellitus and their relation to diabetes control.

## **2. Material & methods:**

This case-control study was conducted from December 2014 to March 2015. A total of 223 consecutive subjects (102 with type 2 diabetes and 121 healthy controls) attending an out-patient clinic at Omdurman Teaching Hospital were interviewed by the researchers using a structured questionnaire based on the Epworth Sleepiness Scale (ESS). All patients with type 2 diabetes who agree to participate were included, the control subjects were recruited from the co-patients attending the same department. Full medical history and thorough clinical examination were undertaken, patients with chronic medical conditions like rheumatic disorders as were those with psychological diagnosis, cigarettes smokers, and alcohol consumers were excluded.

### **Measures:**

The Epworth Sleepiness Scale

The Epworth Sleepiness Scale (ESS): a well-validated self-reported scale<sup>[10]</sup> for testing daytime sleepiness asks how to dose or feel asleep in different 8 situations: Watching TV,

sitting and reading, sitting inactive in public places, as a passenger in a car for one hour without a break, lying down to rest in the afternoon when circumstances permit, sitting talking to someone, sitting quietly after a lunch without alcohol, and in a car, while stopped for a few minutes in traffic. Each component score from 0-3 with 0=no and 3=severe tendency to dose. A total score of 10 out of 24 is regarded as having daytime sleepiness.

### **Body Mass Index**

The patient's weight, height, and Body Mass Index (BMI) as measured using the formula: Weight in Kg/height in (meters)<sup>2</sup> were recorded. Obesity was defined as a BMI =30 or more, overweight 25-29, and 18-25 as normal

The degree of diabetes control.

A blood sample was taken for glycated hemoglobin (HbA1c %) estimation and those with HbA1c of < 8 were regarded as accepted controlled<sup>[11]</sup>.

### **Sleep duration**

Duration of sleep was assessed by self-reported habitual sleep duration, and short sleep duration was considered as sleeping < 6 hours/night<sup>[12]</sup>. All participants signed a written informed consent form, and the local ethical committee approved the research.

### **Analysis;**

Data was analyzed by using the Statistical Package for Social Sciences software (SPSS version 20). The chi-square and t-test were used for testing the statistical significance, data were presented as percentages or mean± SD, and a P-value of less than 0.05 was considered as statistically significant.

**3. Observation &Results:**

Out of 223 subjects 102 were diabetics and 121 healthy controls. The mean age was 58.4±8.7 for diabetic patients, and 50.4±10.1for controls (P-value= 0.001), twenty-nine (28.9%), and forty-three (35.5%) were males in diabetics and controls respectively (P-value 0.314). Daytime sleepiness was evident in 41(40.2%), and 13(10.7%) of diabetic patients and controls respectively (P-value= 0.001), while sleeping less than 6 hours per night was detected in 57 (55.9%) of patients with diabetes, and18 (14.9%) of controls (P-value= 0.001) Table (1).

Table (2) showed a comparison between accepted, and poorly controlled diabetes mellitus, in which the mean age was 59.7 ± 9.8 years for accepted control patients and 57.9 ± 8.1for poorly controlled group with no significant difference between the two groups

(P-value= 0.269). Females dominance was evident, 23 (63.9%) vs. thirteen (36.1%) males in good control patients, and 50 (75.8%) vs.16 (24.2%) men in the poor control patients (P- value=0.259). Eleven (30.5%) of good control patients were obese while obesity was detected in 41 (62.1%) in poorly controlled patients. (P-value= 0.002). Snoring was evident in 18 (50%) in good control patients and 40 (60.6%) in poorly controlled patients with a high significant statistical difference. (P-value= 0.000). Regarding sleeping hours per night 21 (58.3%) of accepted control patients sleep less than 6 hours per night, while sleeping less than 6 hours per night was detected in 36 (54.5%) of poorly control patients (P-value= 0.83). The daytime sleepiness was detected in 5 (13.8%) of patients with good control, and 36 (54.5%) of patients with poor control. (P-value= 0.000)

**Table (1) Characteristics of the study group**

Character	DM n=102	Controls n=121	P-value
<b>Age</b> (mean ±SD)	58.4±8.7	50.4±10.1	0.001
<b>Sex</b>			0.314
Males	29 (28.9%)	43 (35.5%)	
Females	73 (71.1%)	78 (64.5%)	
<b>Daytime sleepiness</b>	41(40.2%)	13 (10.7%)	0.000
<b>Sleeping hours</b>			0.000
< 6 hours	57 (55.9%)	18 (14.9%)	
6-9 hours	45 (44.1%)	103 (85.1%)	

**Table (2) Characteristics of good and poor control diabetic patients**

Character	Good control No= 36	Accepted control No= 66	Odd ratio	P- value
Age	59.7 ± 9.8	57.9±8.1		0.269
Sex			0.56	0.252
Male	13 (36.1)	16 (24.2)		
Female	23 (63.9)	50 (75.8)		
BMI				0.002
Normal	7 (19.5)	2 (3.0)		
Obese	11 (30.5)	41 (62.1)		
Overweight	18 (50.0)	23 (34.9)		
Snoring				0.000
Present	18 (50%)	40 (60.6)		
Absent	18 (50%)	26 (39.4)		
Sleeping hours			1.16	0.83
< six hours	21 (58.3.)	36 (54.5)		
6 to 9 hours	15 (41.7)	30 (45.5)		
Daytime sleepiness			7.44	0.000
Positive	5 (13.8)	36 (54.5)		
Negative	31 (86.2)	30 (45.5)		

**4. Discussion:**

The present data showed a high prevalence of daytime sleepiness and short sleep duration among patients with type two diabetes mellitus with a significant statistical difference between patients and healthy control subjects. Patients with poor diabetes control were more obese, snore more, and had more rate of daytime sleepiness.

In the present study daytime sleepiness was reported in 40.2% of diabetic patients as compared to healthy control subjects (10.7%) (P<001) and is higher than the finding of a study conducted in Romania<sup>[13]</sup> and concluded daytime sleepiness in 22.3% of obese patients with diabetes mellitus, similar to this study

Medeiros et al. confirmed daytime sleepiness In 56% of hospitalized diabetic patients<sup>[14]</sup> the variation in the prevalence among these studies can be attributed to sample size.

In the current study short sleep duration was reported in 55.9% of diabetic patient and 14.9% of healthy control subjects (P<0.001), similarly a systematic review and meta-analysis paper published by Cappuccio et al.<sup>[9]</sup> concluded that: quantity and quality of sleep consistently and significantly predict the risk the development of type2 diabetes mellitus Excessive daytime sleepiness is a significant manifestation of obstructive sleep apnea, and the current guidelines to treat this morbid disorder need not only apnea-hypopnea index

of >5 but also the presence of daytime sleepiness<sup>[15]</sup>, furthermore, the United Kingdom Prospective Diabetes Study (UKPDS) demonstrated that microvascular complication of diabetes mellitus was reduced by tight glycaemic control<sup>[16]</sup>.

The notable finding of this study is the high prevalence of daytime sleepiness in those with poor diabetes control as compared with good control ((54.5%), and (13.8%) respectively with a high significant statistical difference ( $P < 0.001$ ). In accordance with this study Adriana et al.<sup>[13]</sup> observed in his study that daytime sleepiness is associated with high HbA1c as it increased by 1.2% in sleepier patients.

Snoring a manifestation of obstructive sleep apnea had been linked to insulin resistance and type2 diabetes through the release of stress hormones and tumor necrosis factor caused by oxygen desaturation<sup>[17,18]</sup>.

In the current study, snoring was evident in 50-60.6% of patients with a significant statistical difference between accepted and poor controlled type2 diabetic patients, in accordance with by Marchiseni et al. who reported habitual snoring in 56.1% of obese patients<sup>[19]</sup>.

Because microvascular complications of diabetes mellitus remain the leading cause of renal failure and blindness in developed countries and are more closely related to hyperglycemia than macrovascular complications<sup>[20]</sup>, tight glycaemic control is of paramount importance to delay these

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deleterious diabetes complications. This study presented a sample of Sudanese diabetic patients with unwanted features like poor control (64.7%), a high prevalence of daytime sleepiness, snoring, sleeping less than 6 hours per night, obesity, and overweight (91.1%).

The limitation of this study is the small size of the sample, and the conduction at a single outpatient clinic so generalization cannot be insured. The reliance of self-administered questionnaire is subjective as patients may over-estimate or under-estimate their recording of feeling asleep. The major strength of the present study is the use of glycated hemoglobin to measure the degree of control. Larger multicenter studies with the use of objective measures are needed.

## 5. Conclusion

Daytime sleepiness and little nighttime sleeping hours, and snoring were more prevalent in Sudanese diabetic patients and among those with poor diabetic control. In the light of the current data diabetic educators may need to screen for daytime sleepiness and snoring, (both are predictors of obstructive sleep apnea) as part of holistic diabetes care and refer patients for more evaluation and management when indicated. Measures to improve the quality of sleep in patients with type2 diabetes mellitus and health education about good sleep hygiene are highly recommended, to approximate HbA1c level to targets and hence preventing microvascular complications.

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